

(19)



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(11)

EP 0 968 849 A2

(12)

## EUROPEAN PATENT APPLICATION

(43) Date of publication:  
05.01.2000 Bulletin 2000/01

(51) Int Cl.7: B60C 11/12, B60C 11/04

(21) Application number: 99304726.5

(22) Date of filing: 17.06.1999

(84) Designated Contracting States:  
AT BE CH CY DE DK ES FI FR GB GR IE IT LI LU  
MC NL PT SE  
Designated Extension States:  
AL LT LV MK RO SI

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(30) Priority: 18.06.1998 DE 19827244  
28.09.1998 DE 19844437

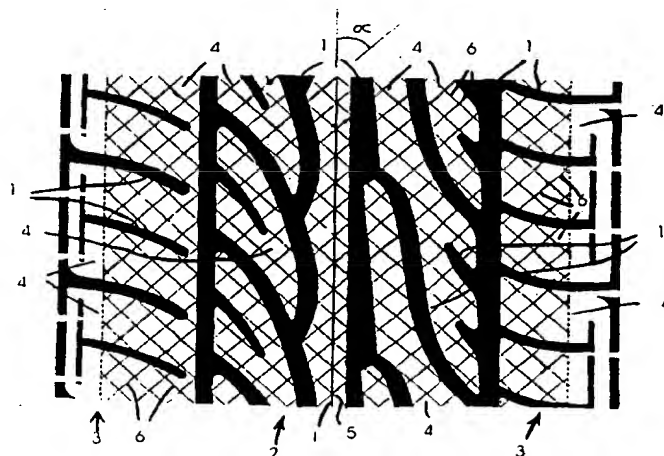
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(54) Method of shaping tread patterns for vehicle tyres and vehicle tyres shaped in accordance therewith

(57) A method of shaping a plurality of tread patterns for motor vehicles, which bring about driving characteristics which differ from one another and which have tread blocks (4) and/or tread ribs (5) separated from one another by broad cut-outs (1), and a plurality of fine cuts (6) in the tread blocks (4) and/or ribs (5). For the shaping of tread patterns with different driving characteristics, but corresponding outer appearance, a common basic pattern of tread blocks (4) and/or tread ribs (5) is specified for all tread patterns, which determines the basic characteristics of the tread pattern, and furthermore a

pattern which is common to all tyre tread patterns is specified of a plurality of fine surface cuts (6), which are basically respectively introduced into the tread blocks (4) and/or tread ribs (5) of the tyre with a low depth, which does not essentially influence the driving characteristics of the tyre. Furthermore, depending on the desired driving characteristics of the relevant tread pattern, sections (7) of the fine cuts (6) of this pattern are selected, which are to be formed with at least a greater depth which co-determines the driving characteristics of the tyre.

Fig 1



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## Description

[0001] The present invention relates to a method of shaping a plurality of tread patterns for motor vehicles, which bring about driving characteristics which differ from one another and which have tread blocks and/or tread ribs separated from one another by broad cut-outs and a plurality of fine cuts in the tread blocks and/or ribs and also to vehicle tyres shaped in accordance therewith.

[0002] The driving characteristics of motor vehicle tyres are substantially determined by the kind, number and arrangement of the tread blocks and tread ribs which are formed by the introduction of broad cut-outs into the tread surface. The most diverse embodiments of motor vehicle tyres with such tread blocks and tread ribs are known, which are selected in accordance with the desired driving characteristic, i.e. in accordance with the main intended purpose.

[0003] Moreover, it is known to provide fine lamella-like cuts or sipes in the tread blocks and tread ribs in order to further influence the driving characteristics of the tyre. For example, in winter tyres, such lamella cuts are used to improve the traction of the tyre on snow. The external appearance of the tyre is admittedly also influenced by these lamella cuts. This impression is, however, mainly determined by the tread blocks and tread ribs. This means that vehicle tyres with different driving characteristics also have a considerably different appearance and this is a disadvantage in that tuning a tyre's pattern for a given performance causes an inevitable changes in its appearance.

[0004] The invention is now based on the object of setting forth a method of shaping tread patterns for vehicle tyres with which tread patterns with different driving characteristics can be shaped, which nevertheless have essentially a corresponding same outer appearance.

[0005] Accordingly the object is satisfied in that a basic pattern of tread blocks and/or tread ribs is specified which determines the basic characteristics of the tyre tread and which is the same for all tread patterns characterised by a pattern of fine surface cuts is additionally specified, which is substantially the same for all tread patterns, with the surface cuts being in each case basically introduced into the tread blocks and/or tread ribs of the tyre with a low depth which does not substantially influence the driving characteristics of the tyre, and in that, depending on the desired driving characteristic of the relevant tread pattern, sections of the fine cuts of this pattern are selected which are to be formed at least with a greater depth which co-determined the driving characteristics of the tyre.

[0006] By the designing of all tread patterns with a corresponding basic pattern of tread blocks and/or tread ribs and with a corresponding pattern comprising a plurality of fine surface cuts, all the tread patterns have a corresponding outer appearance through the method of the invention. The surface cuts have essentially no in-

fluence on the driving characteristics of the vehicle tyre, but rather serve solely for the optical design. However, in order to be able to provide variation in driving characteristics of the tread patterns to give different performance characteristics, the fine surface cuts are formed section-wise with a greater depth, so that these sections co-determine the driving characteristics of the tyre. The deepening section-wise does not, however, change the outer appearance of the vehicle in practice so that a change of the driving characteristics is possible without changing the outer appearance. Thus with the method of the invention, vehicle tyres with different driving characteristics can be provided, which nevertheless have a common appearance.

[0007] In accordance with one embodiment of the invention, the fine cuts in the non-deepened sections have a depth of about 1 mm. In this way an influence on the driving characteristics is, on the one hand, precluded, and, on the other hand, a common optical appearance of the tyres is provided.

[0008] In accordance with a further design of the invention the deepened sections are also broadened somewhat in comparison to the fine surface cuts.

[0009] A first further development lies in the fact that the fine cuts at least partly have interruptions. In this way the appearance of the tyre can be varied. Moreover, the basic characteristics of the vehicle tyre are less strongly influenced than with uninterrupted cuts.

[0010] In accordance with a further embodiment of the present invention, the fine cuts end at least partly at a distance from the edges of the tread blocks and/or tread ribs. The optical appearance can also be varied further in this way. Moreover, the basic characteristics of the tyre, which are pre-set by the tread block and the tread ribs, are also less strongly changed here.

[0011] A particular optical effect also results from the fact that, in accordance with a further design of the invention, an encircling line formed as a fine cut is provided in at least some of the tread blocks and/or ribs at a small distance from the edge of the respective tread block or of the respective tread rib. The remaining fine cuts of the respective tread block or of the respective tread are in this arrangement in particular only provided within the region enclosed by the encircling line.

[0012] In accordance with a further embodiment of the invention, no fine cuts are present in selected regions of the tread pattern. The tread blocks or ribs in respective tread rib are in this arrangement in particular only provided within the region enclosed by the encircling line.

[0013] In accordance with a further embodiment of the invention, no fine cuts are present in selected regions of the tread pattern. The tread blocks or ribs in the shoulder region of the tyre can in particular be formed without fine cuts. In this way the influencing of the basic characteristics of the tyre by the pattern of fine cuts is also kept low. In addition a further possibility of varying the optical appearance results.

[0014] The design of tread patterns with different driving characteristics can be additionally brought about by variation of the depths and of the widths and also of the lengths of said sections of the fine cuts. These sections can also be distinguished from one another and indeed both in one tyre and also from tyre to tyre. The outer appearance of the tyre is also advantageously not changed hereby.

[0015] In accordance with one embodiment of the invention, the fine cuts are arranged in a rhombus pattern. In this respect different rhombus angles are possible. In the same way one pattern of the fine cuts can be provided of non-crossing, preferably wave-shaped lines. Both variants result in large freedom in the determining of the desired running characteristics of the tyre.

[0016] In accordance with a further embodiment of the invention, the fine cuts are arranged in a differently designed pattern over the width of the tyre and/or over the circumference of the tyre. In this way further possibilities of varying the running characteristics of the tyre result. In particular the spacing and/or the angle of the lines of the pattern of fine cuts can be selected differently relative to one another over the width of the tyre and/or over the circumference of the tyre.

[0017] In accordance with a further design of the invention, the lines of the pattern comprises fine cuts with an angle of inclination to the circumferential direction of the tyre of ca. 30° to ca. 60°, in particular ca. 40° to ca. 50°. These angles of inclination have proved to be particularly advantageous in order to influence the running characteristics of the tyre by section-wise deepening of the fine cuts.

[0018] In accordance with a further embodiment of the invention, the lines of the pattern of fine cuts have a spacing of ca. 5 to ca. 20 mm, in particular ca. 8 to ca. 12 mm. This has also proved advantageous for setting the desired running characteristics of the tyre by section-wise deepening of the cuts.

[0019] According to another aspect of the invention a vehicle tyre manufactured in accordance with the method of the invention has a tread pattern which includes tread blocks and/or tread ribs separated by broad cut-out grooves by which the basic characteristics of the tyre are determined, characterised by a plurality of fine cuts in the tread blocks and/or in the tread ribs which are only introduced into the tread surface with a reduced depth, such that they do not substantially affect the driving characteristics of the tyre. The fine cuts can in this arrangement have different depths and/or widths and also lengths, so that the vehicle tyres of the invention can have respectively differing running characteristics with the same outer appearance. For one and the same vehicle tyre the depth of the deepened sections of the fine cuts, their width and their length can at least be partly different.

[0020] Embodiments of the invention are shown in the drawings and will be described in the following. There are shown, in each case in schematic representation:

- Figure 1 a plan view of a tread section of a vehicle tyre with tread block and tread ribs and also fine surface cuts;
- Figure 2 a plan view of the tread section of Figure 1, with fine cuts which are deepened section-wise;
- Figure 3 a plan view of the tread section of Figure 1, with fine cuts which are deepened section-wise in a second variant;
- Figure 4 a plan view of a tread section of a variant of the vehicle tyre of the invention;
- Figure 5 a plan view of a tread section of a further variant of the vehicle tyre of the invention; and
- Figure 6 a plan view of a tread section in which the fine surface cuts are interrupted lines.

[0021] The tread pattern shown in Figure 1 has a number of broad cut-outs or main tread pattern defining grooves 1, which are provided in the tread surface 2 of the tyre and also partly in the side regions 3 of the tyre. These broader grooves 1 form tread blocks 4 and also a tread rib 5 at the centre of the tyre. In addition to the broad cut-outs 1 fine cuts 6 are introduced at the surface in the tread 2 into the tread blocks 4 and into the tread ribs 5. The fine cuts 6 are arranged in a rectangular rhombus pattern, which is evenly laid over the tread surface 2. The tread pattern that is shown continues in corresponding manner along the central, peripheral line 1.

[0022] The broad cut-outs and tread blocks 4 and the tread ribs 5 from the basic pattern of the present tread pattern, by which the basic driving characteristics of the tyre are determined. The fine cuts 6, which are introduced with a depth of only ca. 1 mm into the tread blocks 4 and the tread ribs 5, have in contrast only an insignificant influence on the driving characteristics. They simply determine, together with the broad cut-outs 1 and the tread blocks 4 and the tread ribs 5, the outer appearance of the tyre.

[0023] In order to now be able to vary the driving characteristics of the tyre without changing the outer appearance, the fine cuts 6 are deepened section-wise in localised areas. A special design of a tread pattern with fine cuts 6 deepened section-wise is shown in Figure 2. Another special embodiment is shown in Figure 3. The deepened sections 7 of the fine cuts 6 are in this arrangement shown by thicker lines. This does not necessarily mean that the fine lines 6 in the sections 7 also actually have a greater width. It is, however, entirely possible to also design these sections at least partly with a greater width in addition to the greater depth. The deep sections 7 now additionally influence the driving characteristics of the tyre. The tread patterns shown in Figures 1 to 3 thus each signify tyres with respectively different driving characteristics. As one can see, tyres with different driving characteristics can be provided thereby, but which nevertheless have a common outer appearance.

[0024] Practically any desired variations are possible, both with respect to the basic pattern of broad cut-outs 1, tread blocks 4 and tread ribs 5, and also with respect of the pattern of fine cuts 6, so that the common outer appearance of the tyre with different driving characteristics can also be selected differently. Two further examples of a basic patterns with broad cut-outs 1 and tread blocks 4 and also a pattern of fine surface cuts 6 provided in the tread blocks 4 are shown in Figure 4, the fine cuts 6 run in a central region of the tread along a non-rectangled rhomboid pattern, which merges in the two edge regions of the tread into a right-angled rhombus pattern. In the variant of Figure 5 the fine cuts 6 extend partly along curved lines. In both cases the pattern of fine cuts 6 thus changes over the width of the tyre. Almost any desired further possibilities of variation to this are also present.

[0025] The fine cuts 6 of the Figures 4 and 5 are formed deeper section-wise for the design of tyres with different driving characteristics, but outwardly with the common appearance of the pattern of Figure 4 or Figure 5, in just the same way as in the example of the Figures 1 to 3.

[0026] The embodiment in Figure 6 has a plurality of broad cut-outs 1, which are provided in differing manner in the tread surface 2 and partly also in the tyre side regions 3. The tread blocks 4 and also a tread rib 5 at the centre of the tyre are formed by the broad cut-outs 1

[0027] In addition to the broad cut-outs 1, fine cuts 6 are introduced in a central tread region A at the surface into the tread blocks 4 and into the tread ribs 5, whereas in the two shoulder regions B of the tyre no fine cuts are present in the tread blocks 4. The fine cuts 6 are arranged in a right-angle rhombus pattern, with the lines being interrupted. In addition, fine cuts are provided in the shape of encircling lines 9 at a small distance from the side of the broad cut-outs 1, i.e. a small distance from the tread block edges.

[0028] The broad cut-outs 1 and the tread blocks 4 as well as the tread rib 5 form the basic pattern of the present tread pattern, by which the basic driving characteristics of the tyre are determined. The fine cuts 6 and the encircling lines 9, which are in particular introduced with a depth of only ca. 1 mm into the tread blocks 4 and into the tread rib 5, have in contrast an insignificant influence on the driving characteristics. They simply determine, together with the broad cut-outs 1 and the tread block 4 and also the tread rib 5, the external appearance of the tyre.

[0029] In order to now be able to vary the driving characteristics of the tyre without changing the outer appearance, the fine cuts 6, but also the encircling lines 9, can be made deeper section-wise. In addition to a greater depth, these sections can also be formed with a greater width. These sections now additionally influence the driving characteristics of the tyre.

[0030] Practically any desired variations are possible, both with respect to broad cut-outs, tread blocks 4 and

tread ribs 5, as well as with respect to the pattern of fine cuts 6 and encircling lines 9, so that the corresponding outer appearance of the tyre can be differently selected with different driving characteristics. The illustrated features of the fine cuts 6 and of the encircling lines 9 can in each case be provided separately and in any desired combination with one another. Instead of a rhombus pattern, any other desired pattern can also be provided, for example curved lines, in particular wave-shaped lines, which, in accordance with the illustrated embodiment, can be interrupted, and have a spacing from the edge 8 of the tread blocks 4 and of the tread rib 5 and can in each case only be provided within a fine cut formed as an encircling line 9. The pattern of the fine cuts 6, their spacing and/or angle can also be varied over the width of the tyre and/or over the circumference of the tyre.

[0031] In total, tread patterns for vehicle tyres thus result which can be varied without changing their outer appearance in order to be able to form a series of vehicle tyres with the same appearance, but with different driving characteristics. The manufacturing process is in this arrangement not complicated and not costly.

## 25 Claims

1. A method of shaping a plurality of tread patterns for motor vehicles which bring about driving characteristics which differ from one another, and which have tread blocks (4) and/or tread ribs (5) separated from one another by broad cut-outs (1) and a plurality of fine cuts (6) in the tread blocks (4) and/or ribs (5), characterised in that a basic pattern of tread blocks (4) and/or tread ribs (5) is specified which determines the basic characteristics of the tyre tread and which is the same for all tread patterns, in that a pattern of fine surface cuts (6) is additionally specified, which is the same for all tread patterns, with the surface cuts being in each case basically introduced into the tread blocks (4) and/or tread ribs (5) of the tyre with a low depth which does not substantially influence the driving characteristics of the tyre, and in that, depending on the desired driving characteristic of the relevant tread pattern, section (7) of the fine cuts (6) of this pattern are selected which are to be formed at least with a greater depth which co-determines the driving characteristics of the tyre.

2. A method in accordance with claim 1, characterised in that the fine cuts (6) are to be introduced with a depth ca. 1 mm in the non-deepened sections.

3. A method according to claim 1 or 2, characterised in that the fine cuts (6) are formed at least partly as interrupted lines.

4. A method in accordance with claim 1, 2 or 3, char-

acterised in that the driving characteristics are also influenced by a broadening of the fine cuts (6) at least partly in addition to the increase in the depth of the fine cuts (6).

5. A method in accordance with one of the preceding claims, characterised in that the depth of the fine cuts (6) in the deepened sections (7) is determined differently depending on the desired driving characteristic.

6. A method in accordance with one of the preceding claims, characterised in that the length of the deepened sections (7) is specified differently depending on the desired driving characteristic of the respective tyre.

7. A method in accordance with one of the preceding claims, characterised in that the fine cuts (6) are arranged in a rhombus pattern.

8. A method in accordance with one of the claims 1 to 6, characterised in that the fine cuts (6) are arranged in a pattern of non-crossing, preferably wave-shaped lines.

9. A method in accordance with one of the preceding claims, characterised in that the fine cuts (6) are arranged in a pattern which is differentially designed over the width of the tyre and/or over the circumference of the tyre.

10. A method in accordance with claim 9, characterised in that the spacing and/or the angle of the lines of the pattern consisting of fine cuts (6) are selected differently among one another over the width of the tyre and/or over the circumference of the tyre.

11. A method in accordance with one of the preceding claims, characterised in that the lines of the pattern of fine cuts (6) are provided with an angle of inclination to the circumferential direction (I) of the tyre of ca. 30° to 60°C, in particular of ca. 40° to 50°C.

12. A method in accordance with one of the preceding claims, characterised in that the lines of the pattern of fine cuts (6) are provided with a spacing from one another of ca. 5 to ca. 20 mm, in particular of ca. 8 to ca. 12 mm.

13. A vehicle tyre having a pattern with tread blocks (4) and/or tread ribs (5) separated from one another by broad cut-outs (1) through which the basic characteristics of the tyre tread are determined, characterised by a plurality of fine cuts (6) in the tread blocks (4) and/or in the tread ribs (5) which are only

surface cuts and are introduced with a reduced depth into the tread surface which does not substantially influence the driving characteristics of the tyre, but are provided sectionwise with an at least greater depth which co-determines the driving characteristics of the tyre.

13. A vehicle tyre in accordance with claim 13, characterised in that the deepened sections (7) have a different width depending on the desired driving characteristics.

15. A vehicle tyre in accordance with claim 13 or claim 14, characterised in that the deepened sections (7) have a different depth depending on the desired driving characteristic of the tyre.

16. A vehicle tyre in accordance with one of the claims 13 to 15, characterised in that the deepened sections (7) have a different length depending on the desired driving characteristic.

17. A vehicle tyre in accordance with any of claims 13 to 16, characterised in that the fine cuts (6) are formed at least partly as interrupted lines.

18. A vehicle tyre according to any of claims 13 to 17, characterised in that the fine cuts (6) end at least partly at a distance from the edges (8) of the tread blocks (4) or tread ribs (5).

19. A vehicle tyre according to any of claims 13 to 18, characterised in that an encircling line (9) formed as a fine cut (6) is provided in at least some of the tread blocks (4) and/or ribs (5) at a small distance from the edge (8) of the respective tread block (4) or of the respective tread rib (5).

20. A vehicle tyre according to claim 19, characterised in that the remaining fine cuts (6) of the tread blocks (4) or tread ribs (5) only extend within the region enclosed by the encircling line (9).

21. A vehicle tyre according to any of claims 13 to 20, characterised in that no fine cuts (6) are present in selected regions of the tread pattern.

22. A vehicle tyre according to claim 21, characterised in that the tread blocks (4) or tread ribs (5) have no fine cuts (6) in the shoulder region (B).

23. A vehicle tyre in accordance with one of the claims 13 to 22, characterised in that the fine cuts (6) are arranged in a rhombus pattern.

24. A vehicle tyre in accordance with one of the claims 13 to 22, characterised in that the fine cuts (6) are arranged in a pattern of non-crossed, pref-

erably wavy-shaped lines.

25. A vehicle tyre according to any of claims 13 to 24, characterised in that the pattern of fine cuts (6) varies over the width of the tyre and/or over the circumference of the tyre. 5

26. A vehicle tyre in accordance with one of the claims 13 to 25, characterised in that the spacing and/or angle of the lines of the pattern of fine cuts (6) vary amongst one another over the width of the tyre and/or the circumference of the tyre. 10

27. A vehicle tyre in accordance with one of claims 13 to 25, characterised in that the lines of the pattern of fine cuts (6) have an angle of inclination ( $\alpha$ ) with the circumferential direction (I) of the tyre of ca. 30° to ca. 60°, in particular of ca. 40° to ca. 50°. 15

28. A vehicle tyre in accordance with one of the claims 13 to 25, characterised in that the lines of the pattern of fine cuts (6) have a spacing from one another of ca. 5 to ca. 20 mm, in particular of ca. 8 to ca. 12 mm. 20

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Fig 1

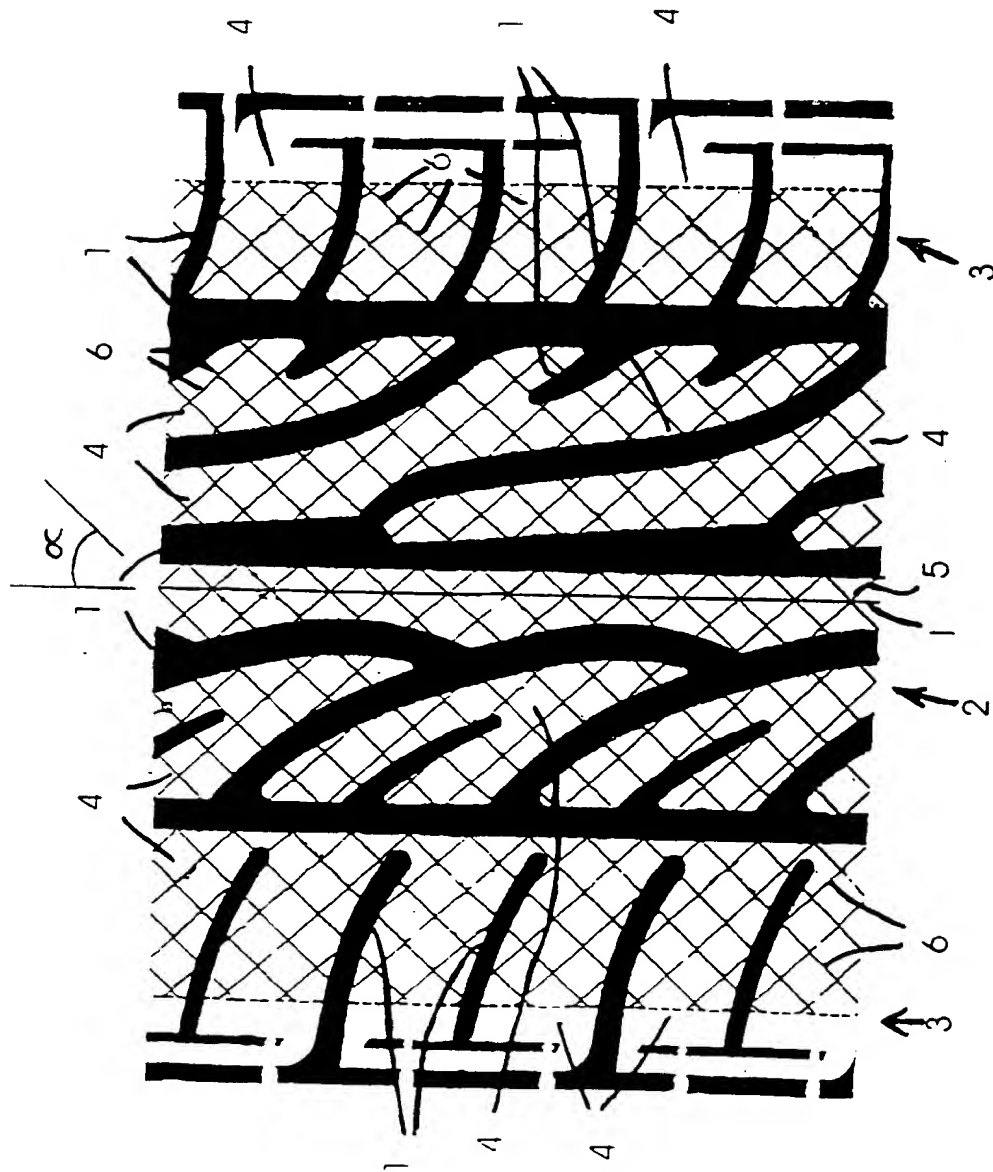


Fig 2

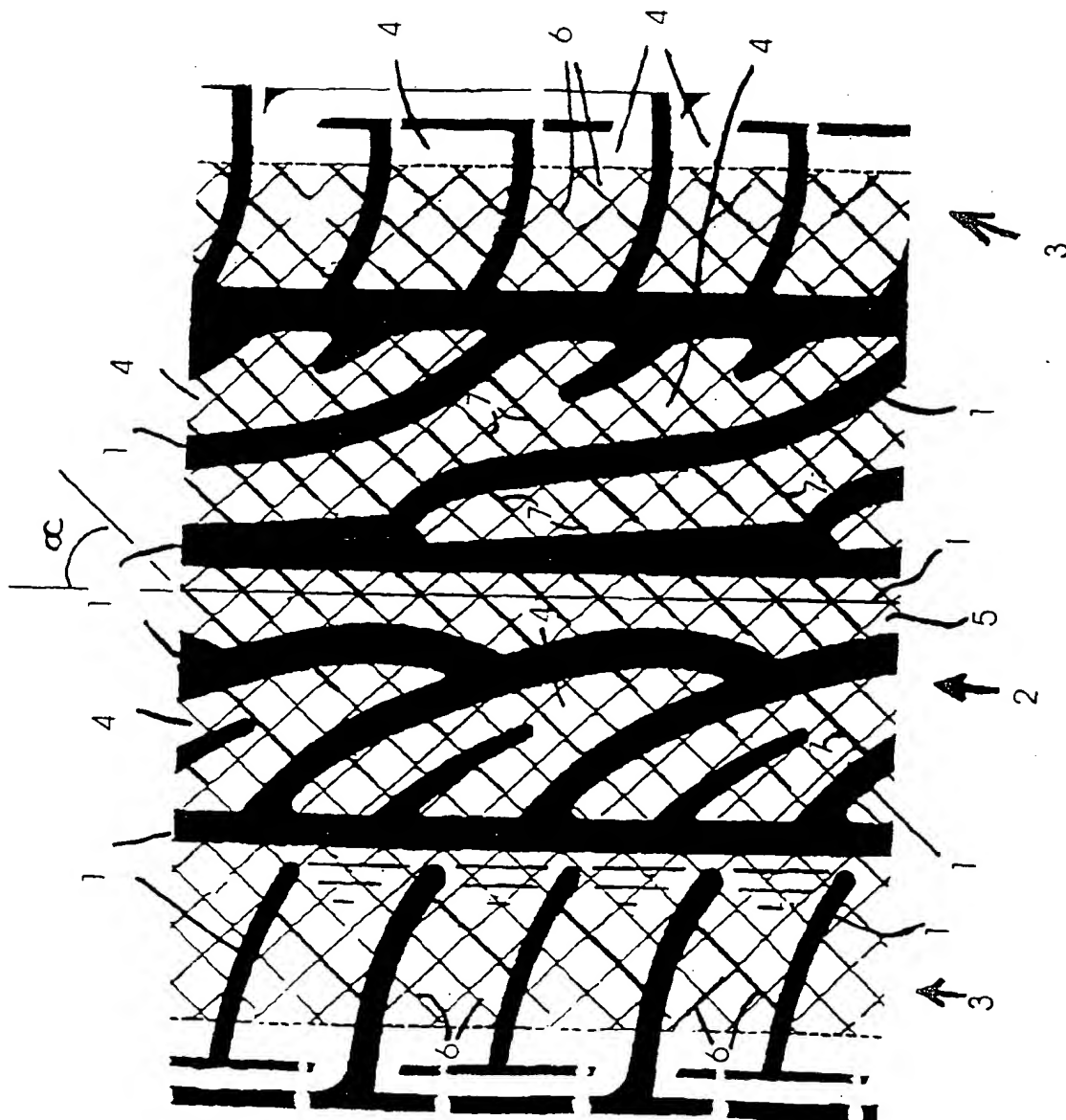




Fig 3

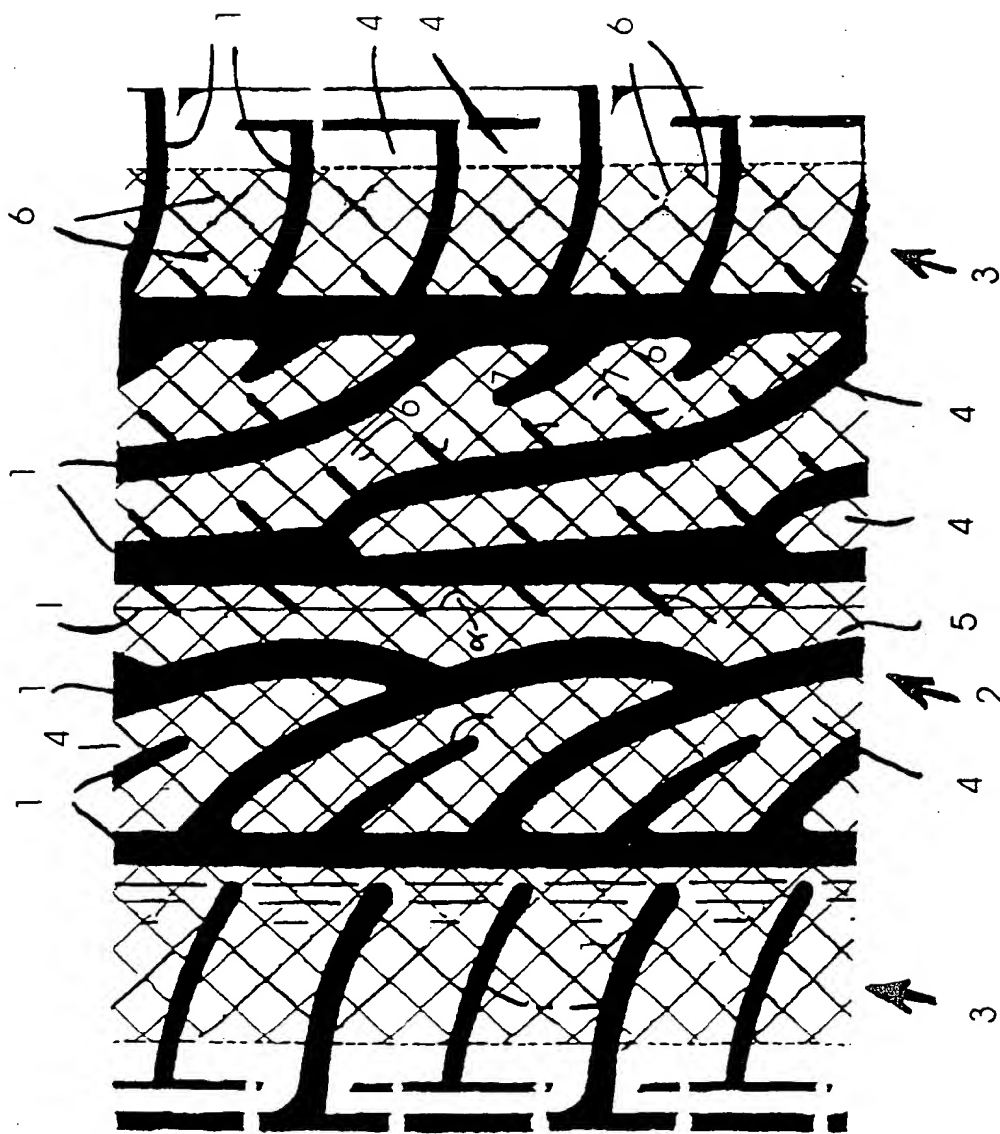


Fig 4

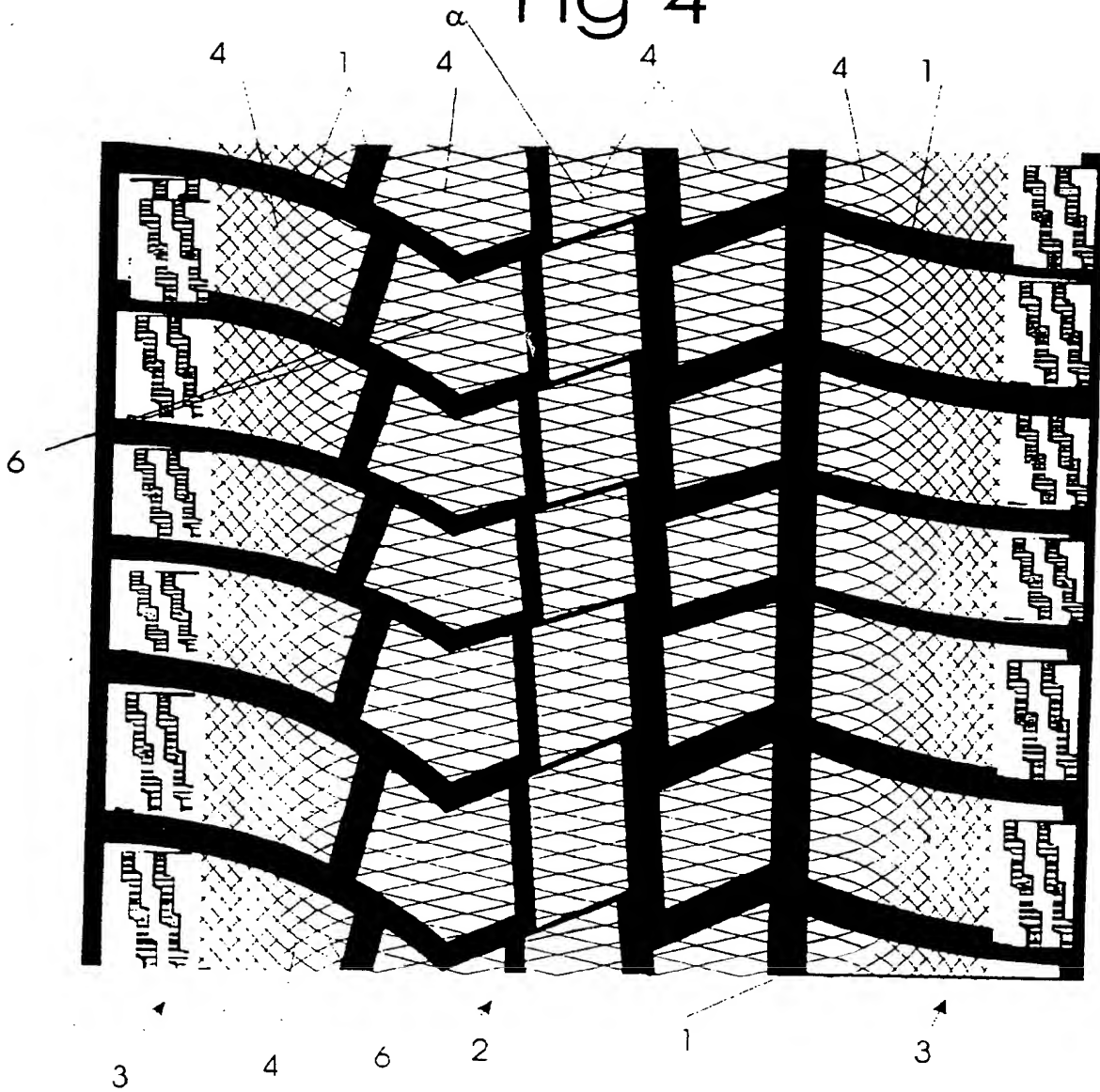


Fig 5

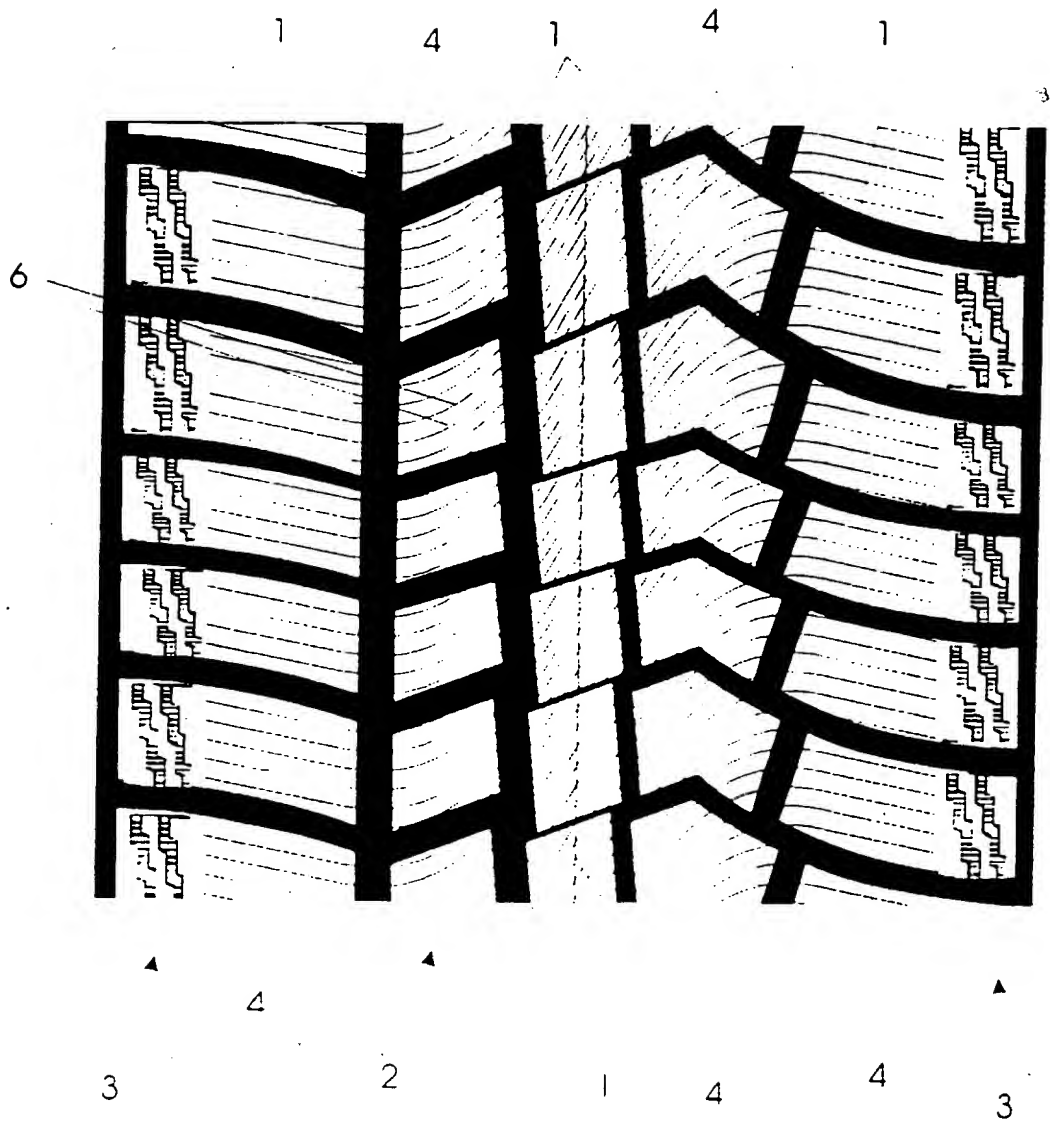


Fig 6

